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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of New York, New York

BAINES, Roger Frederick

Serial No.: 702,615 Date: July 24, 1991

Date Filed: MAY 17 91 Group Art Unit: 212

For: ELECTRIC MOTOR

Hon. Commissioner of Patents
and Trademarks
Washington, DC 20231

Sir:

In accordance with 35 U.S.C. Sec. 119, applicant confirms the request for priority under the International Convention and submits herewith the following documents in support of the claim:

United Kingdom Application No. 9011275.6 filed May 21, 1990

Respectfully submitted,

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(21) Application No 8805994

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(51) INT CL*
H02K 13/10

(52) Domestic classification (Edition J):
H2A BG

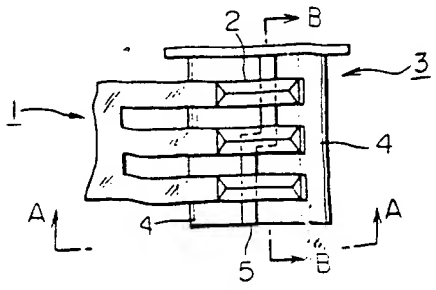
(56) Documents cited
GB A 2172446 GB A 2110005 GB A 2046027

(58) Field of search
H2A
Selected US specifications from IPC sub-class
H02K

(54) Brush shoe cross section for a cranked commutator

(57) A commutator device for electric motors has a commutator with a plurality of commutator segments (4) with which sliding contact is made by brush shoes (2) of brushes (1) formed of electrically conductive metallic strips and having a cross-section forming linear edges which make sliding contact with the commutator. Separating grooves (5) between the commutator segments (4) are formed into a crank shape so that the flow of current from a brush to the commutator is not interrupted. The cross-section is preferably V-shaped, with said linear edges defined either at the distal or the proximal ends of the legs of the V.

FIG. 1A



GB 2 203 899 A

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases

att #5

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number 9011275.6

Relevant Technical fields

(i) UK Cl (Edition K) H2A (AKA5,AKA1B)

(ii) Int Cl (Edition 5) H02K 13/10; H01R 39/62

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

J COCKITT

Date of Search

29 June 1990

Documents considered relevant following a search in respect of claims 1-7

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2203899 A	MABUSHI - whole document	claims 1, 2 at least
Y	EP 0038595 A3	ELTRA - see brush assembly 10	claim 1 at least
Y	US 4698540 A	WESTINGHOUSE - see multiple brushes mounted on a common holder	claim 1 at least
X	US 4037125 A	CANON - see brush pairs 51, 52	claims 1, 2 at least

FIG. 1A

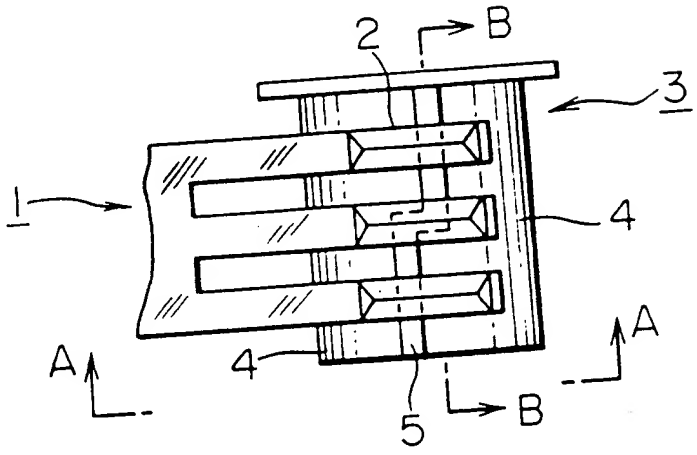


FIG. 1B

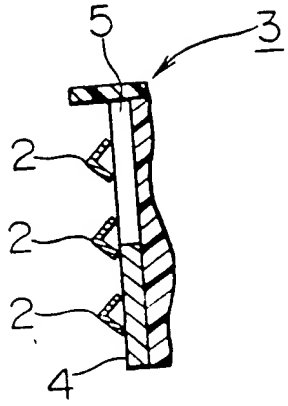


FIG. 1C

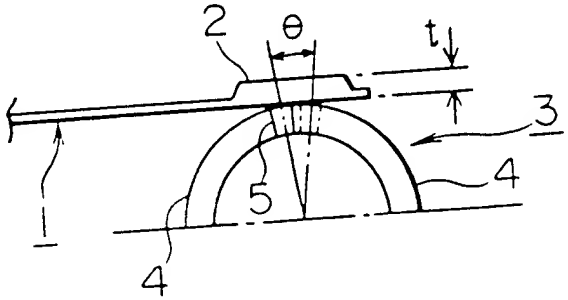


FIG. 2A

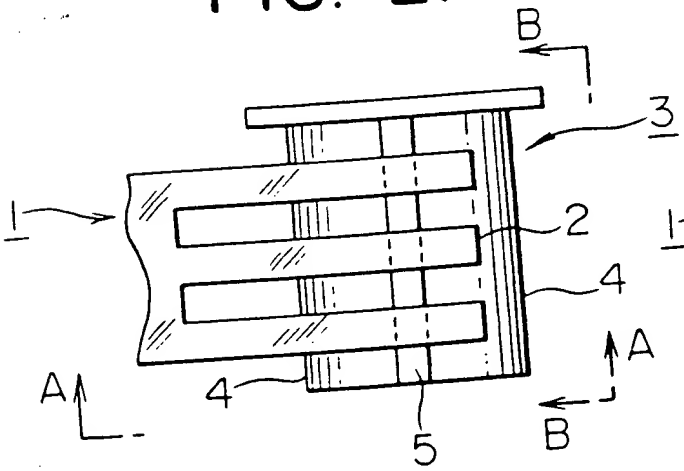


FIG. 2B

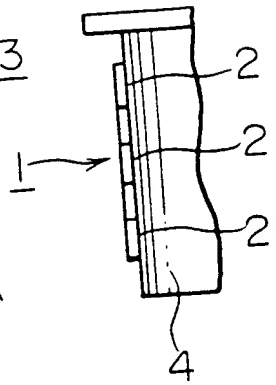


FIG. 2C

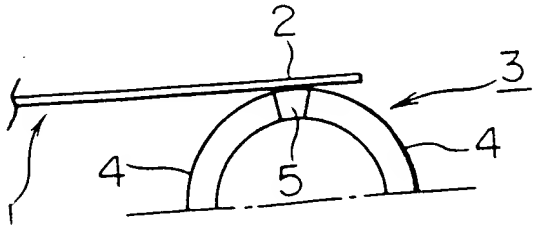


FIG. 3

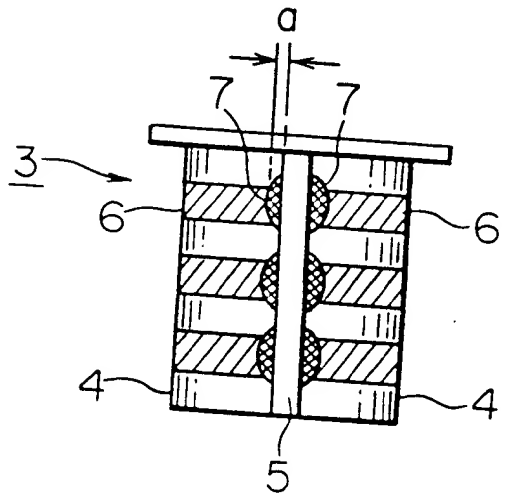


FIG. 4A

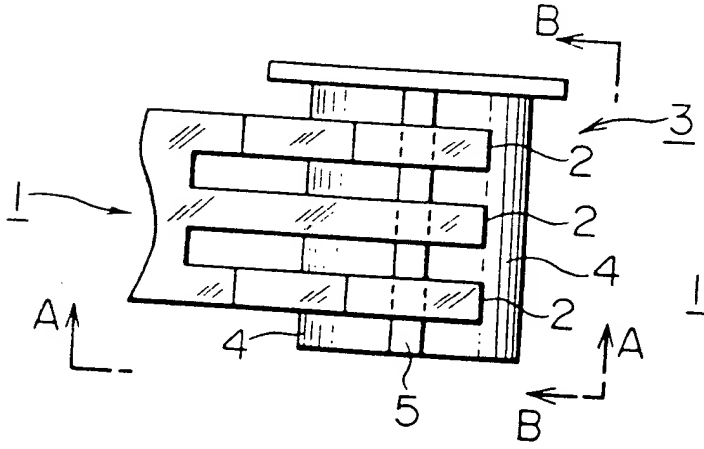


FIG. 4B

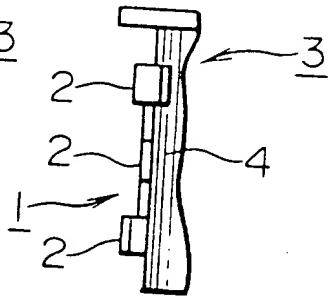


FIG. 4C

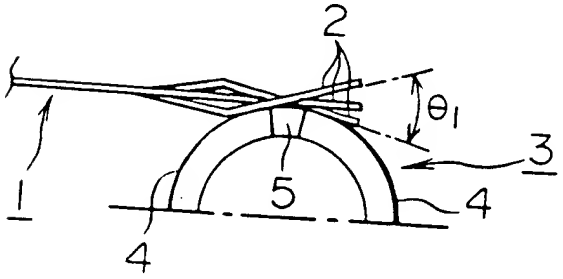


FIG. 5A

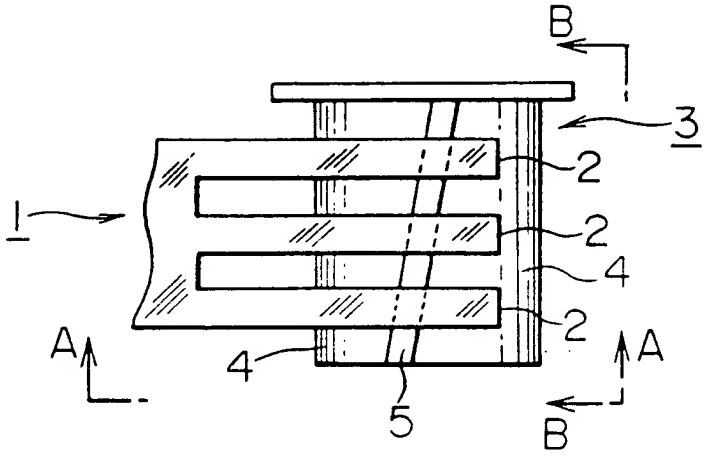


FIG. 5B

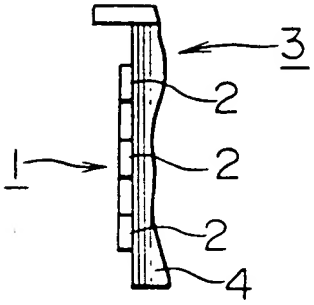


FIG. 5C

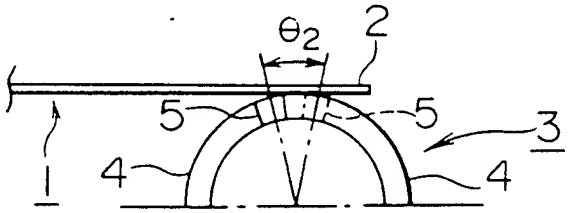


FIG. 6A

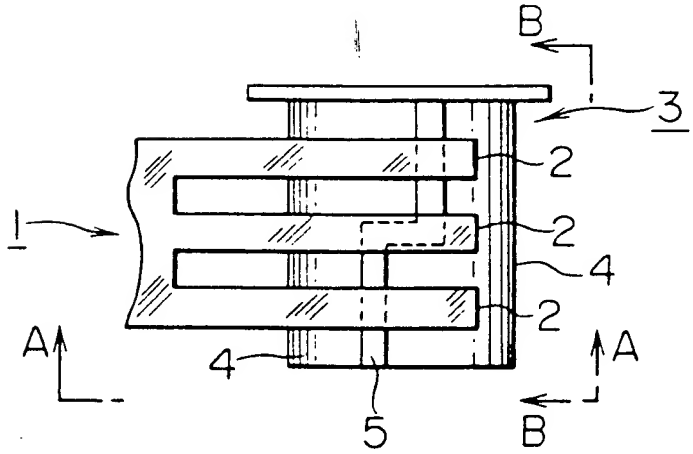


FIG. 6B

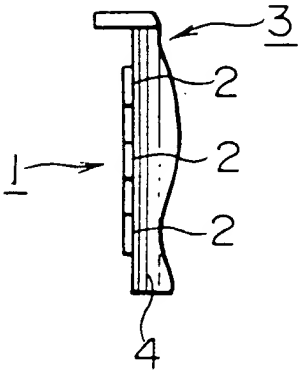
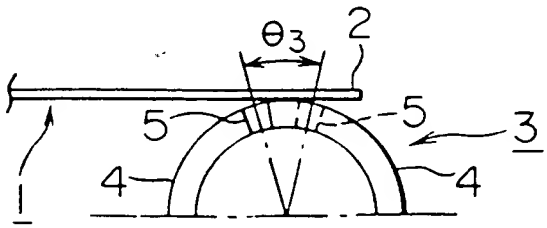


FIG. 6C



COMMUTATOR DEVICE FOR ELECTRIC MOTORS

This invention relates to commutator devices for electric motors. More particularly it relates to a commutator device for miniature motors adapted to maintain good sliding contact between a commutator comprising a plurality of commutator segments and brush shoes extending in planes substantially perpendicular to the commutator axis.

In known electric motors, particularly miniature motors, performance is largely dependant upon the stability and continuity of the supply of electric current to the windings of the motor rotor via the commutating device. The conventional form of commutator has a plurality of commutator segments which are successively in sliding contact with brushes connected to an electrical power source as the rotor rotates. As this contact moves from one segment to the next electrical noise and sparking will normally result, and this together with the sliding contact can cause the production of electrically resistive material on the commutator surface. To reduce these effects, alterations to the shape and orientation of the spaces between successive commutator segments have been proposed to improve the continuity of current flow. However, problems still remain, particularly in the production of electrically resistive material on the commutator surface.

The present invention addresses the above problems, and seeks to provide a mechanism by which obstructive build up of resistive material on the commutator surface

can be restricted while retaining substantial continuity in the flow of electrical current to the commutator. To this end, a commutator device according to the invention comprises a commutator and electrically conductive brushes for making sliding electrical contact therewith, the commutator having a plurality of commutator segments separated by crank shaped grooves, and each brush having at least one brush shoe extending in a plane substantially perpendicular to the commutator axis for tangential engagement with the commutator segments, at least a portion of a said at least one brush shoe having a cross-section shaped to define at least one linear edge extending along the shoe in said plane for engagement with the commutator. Normally, each brush has a plurality of elongate brush shoes extending from the body of the brush to define a plurality of linear edges substantially parallel to one another.

In preferred embodiments of the invention, the or each brush shoe has a V-shaped cross-section which is simple to press into a sheet metal brush for example, and may be oriented such that linear edges at the distal ends of the legs of its cross-section engage the commutator surface. Alternatively, the orientation of the or each shoe may be inverted; ie, such that the linear edge at the junction of the legs of its cross-section engages the commutator surface.

The design of commutator devices according to the invention is simple and easy to apply to the construction of electric motors, particularly miniature motors and

particularly in the mass production thereof. Its benefits include improved stability in the supply of electrical current to the commutator, and extended service life of the device.

The invention will now be described by way of example and with reference to the accompanying drawings which illustrate an embodiment of the invention and a number of previously proposed designs of commutator device. In the drawings:

Figure 1A is an external view of an embodiment of this invention;

Figure 1B a section taken along line B-B in Figure 1A;

Figure 1C a partial end view taken along line A-A in Figure 1A;

Figures 2A, 2B and 2C are views similar to those of Figure 1, but showing an example of a conventional type of commutator device for miniature motors;

Figure 3 shows the formation of blackened foul matter on a commutator of the type shown in Figure 2; and

Figure 4, 5 and 6 show views similar to those of Figure 2, but of other examples of conventional type commutator devices for miniature motors.

Previous proposals for the construction of commutating devices in miniature motors will first be described with reference to Figures 2 to 6.

In conventional miniature motors, a commutator device

as shown in Figure 2 is commonly used. Brushes 1 connected to a supply (not known) carry electrical current to a commutator 3 having commutator segments 4. Each brush 1, usually called a "flat brush", has at the tip thereof fork-shaped brush shoes 2. The commutator segments 4 are separated from each other by separating grooves 5 formed in the axial direction of the motor. Each brush shoe 2 makes sliding contact with the segment 4 along with the rotation of the motor, and as the motor rotates, the following undesirable problems are caused as the brush shoe 2 passes over the separating groove 5.

1) Since the supply of current to the rotor winding is instantaneously interrupted, it is difficult to ensure a constant supply of current to the rotor winding.

2) The instantaneous current interruption causes electrical sparks between the brush shoe 2 and the segment 4, accelerating the wear of both the brush shoe 2 and the segment 4. This leads to reduced service life of the motor.

3) The instantaneous current interruption causes electrical noise, adversely affecting other adjoining electrical equipment.

In the motor shown in Figure 2, blackened foul matter 7 (normally originating from insulating material in the motor) having relatively high electrical resistance tends to build up on the edges of a brush contact zone 6 of the segment 4, that is, the portion of the segment 4 at which the segment 4 makes contact wit the brush shoe 2.

Formation of the blackened foul matter 7 is substantially inevitable because its generation is largely attributed to sliding contact and sparks referred to above.

As the brush 1 shown in Figure 2 is a so-called "flat brush", the pushing force that the shoe 2 exerts on the segment 4 is relatively low, and the area covered by the foul matter 7 tends to extend away from the edges of the segments 4, as indicated at a in Figure 3. As a consequence, the interruption of current to the rotor winding is extended, making the current supply to the rotor winding increasingly unstable.

To meet the above problems, commutator devices for miniature motors of the kind shown in Figures 4 to 6 have been proposed.

In the example shown in Figure 4, the commutator 3 has been adapted with the aim of maintaining a stable current supply to the rotor winding by using a brush 1 of a so-called "cross brush" type. In the example shown in Figure 5, the brush 1 is of the same type as that shown in Figure 2, but the commutator 3 is formed into a so-called "skew" type to stabilize the current supply to the rotor winding. In the example shown in Figure 6, the brush 1 is of the same type as that shown in Figure 2, but the commutator 3 is formed into a so-called "crank type" to stabilize the current supply to the rotor winding.

According to our study, however, in each of these examples the following problems appear:

(1) The brushes 1 used in the examples shown in Figures 4 through 6 are all of the flat type in which the

surface of the brush shoe 2 makes sliding contact with the surface of the segment 4. This tends to increase the area a of blackened foul matter illustrated in Figure 3. Consequently, each of the "cross" angle θ_1 (shown in Figure 4C) of the brush 1 in the example shown in Figure 4, the "skew" angle θ_2 (shown in Figure 5C) of the commutator 3 in the example shown in Figure 5, and the "crank" angle θ_3 (shown in Figure 6C) of the commutator 3 in the example shown in Figure 6 must be set at a relatively large value. For good performance and stability however, and to ensure effective commutation, the "cross" angle θ_1, and "skew" angle θ_2 and the "crank" angle θ_3 should be set at the smallest possible value.

(2) Although a certain degree of wear of brushes cannot be avoided in electric motors of this type, brush wear remains an important element in design which is relevant in determining the life of the motor. However, the brushes 1 used in the examples of Figures 4 to 6 are all of the flat type in which contact is maintained between the surfaces of the brush shoe 2 and the segment 4. For this reason, a relatively short brush life is a disadvantage common to all the examples shown in Figures 4 to 6.

(3) The brush 1 of the "cross" type in the example shown in Figure 4 and the commutator 3 of the "skew" type in the example shown in Figure 5 are complex in construction, and need a high level of manufacturing accuracy in maintaining the above-mentioned angles θ constant. This makes volume production difficult, leading

to high costs.

In the embodiment of the invention shown in Figure 1, a brush 1 has brush shoes 2 formed into a V-shape in cross-section; the two legs each of the inverted V-shaped brush shoes 2 make sliding contact with segments 4. The commutator 3 is of a so-called crank type so that separating grooves 5 provided between the segments 4 are formed into a crank shape having a "crank" angle θ (shown in Figure 1C). The length of the shaped portion of the brush 1; ie, the brush shoe 2 is adapted to make contact with the commutator over a sufficiently wider angle than the crank angle θ so that the brush shoe 2 can make contact simultaneously with two succession segments 4.

Sliding contact between the commutator 3 and the brush 1 in this invention is effected at both ends of the inverted V-shaped legs of the brush shoe 2. Further, the flexural strength of the brush shoe 2 is increased because of the V-shaped cross-section thereof. Each of these factors increases brush pressure per unit area, and results in removal of the blackened foul matter 7 described above with reference to Figure 3 by the rubbing action of both ends of the inverted V-shaped legs of the brush shoe 2.

As a result, the blackened foul matter producing area a can be reduced, making it possible to adopt a relatively small crank angle θ in each separating groove 5. The blackened foul matter 7 can be removed more efficiently by a smaller crank angle than the crank angle θ_3 shown in Figure 6C. This in turn makes it possible to

θ_3 shown in Figure 6C. This in turn makes it possible to substantially improve the commutating effect. In addition, the length of the inverted V-shaped brush shoe section 2 can be reduced due to a small crank angle θ, making if favourable to reduce the size of the motor.

Since the brush shoe 2 is formed into a V-shape and makes sliding contact with the segment 4 at both ends of the inverted V-shaped legs thereof, the height (shown by arrow $\underline{t}$ in Figure 1C) of the portion at which the brush shoe 2 makes contact with the segment 4 is increased. This gives the brush an increased allowance for wear, leading to a substantial increase in the service life of the brush 1.

The brushes 1 and commutator segments 4 are typically formed from electrically conductive metal strips. This enables a straightforward pressing or stamping operation to be employed to form the brush shoe 2 into a V-shape and to form the segment 4 of the commutator 3 into a crank shape with high accuracy and ease, thus facilitating mass production.

In the embodiment shown, the brush 1 has three fork-shaped brush shoes 2 each having the inverted V-shaped cross-section. The brush, however, may have one brush shoe or a plurality of brush shoes, taking into consideration the resiliency of the brush. If the brush is constructed by a plurality of fork-shaped springs, even the contact of the brush shoe with the commutator at the vertex of the V-shape thereof gives a high pushing force per unit area, bringing the same effect as described

As described above, this invention makes it possible to increase pushing force per unit area between the commutator and the brush, thus preventing or at least inhibiting the obstructive formation of blackened foul matter of the kind shown in Figure 3. This enables electrical contact to be stabilized. The V-shaped brush gives the brush shoe an increased allowance for wear, and can be mass-produced at high accuracy by a stamping operation. As a result, the commutating effect can be stabilized and improved, and electrical sparks can be substantially reduced or eliminated. This results in an extended service life of the brush, and accordingly in an increased life of the motor. Being largely free of electrical sparks, motors including devices of this invention do not adversely affect other pieces of electrical equipment.

CLAIMS

1. A commutator device for electric motors comprising a commutator and electrically conductive brushes for making sliding electrical contact therewith, the commutator having a plurality of commutator segments separated by crank shaped grooves, and each brush having at least one brush shoe extending in a plane substantially perpendicular to the commutator axis for tangential engagement with the commutator segments, at least a portion of said at least one brush shoe having a cross-section shaped to define at least one linear edge extending along the shoe in said plane for engagement with the commutator.

2. A commutator device according to Claim 1 wherein said portion of said at least one brush shoe has a V-shaped cross-section.

3. A commutator device according to Claim 2 wherein said at least one brush shoe is oriented such that linear edges at the distal ends of the legs of its cross-section engage the commutator surface.

4. A commutator device according to Claim 2 wherein said at least one brush shoe is oriented such that the linear edge at the junction of the legs of its cross-section engages the commutator surface.

5. A commutator device according to any preceding claim wherein each brush has a plurality of elongate brush shoes extending from the body of the brush to define a plurality of linear edges substantially parallel to one another.

6. A commutator device for electric motors substantially

as described herein with reference to Figures 1A, 1B and 1C of the accompanying drawings.

7. An electric motor including a commutator device according to any preceding Claim.

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(54) Removable brush holder for dynamoelectric machine.

(57) A dynamoelectric machine (1), having brushes which contact an armature contact surface such as commutator (6) or slip rings, is provided with a plurality of independent, individually removable brush holders (10, 100). Each brush holder is provided with either a removable pin (102) to allow brushes to contact the armature contact surface after the brush holder (10, 100) has been installed, or with a clamping bolt (40), retaining brushes (8) in a predetermined position for insertion of the brush holder, and removal of the brush holder, the brush holder being tilted or cocked to avoid contact between it and the armature contact surface. Bolting the brush holder (10, 100) into place makes electrical contact between the dynamoelectric machine and the brush holder by means of an insulated, conductive threaded aperture (34) on the exterior surface of the machine, a mounting bolt (24) inserted into this aperture (34) urging a conductive portion (20) of the brush holder into electrical contact. The brush holder (10, 100) may be further provided with a rotatable spring support (212) for varying the pressure exerted on the brushes, and a measuring scale (216) for correlating the length of partially worn brush with an angular position of the spring support, to facilitate adjustment of brush pressure as brushes wear. Angular adjustment of the position of the spring support may also serve to lift certain types of brushes into a retracted position. The disclosed brush pressure adjustment structure is also usable with non-removable brush holders.

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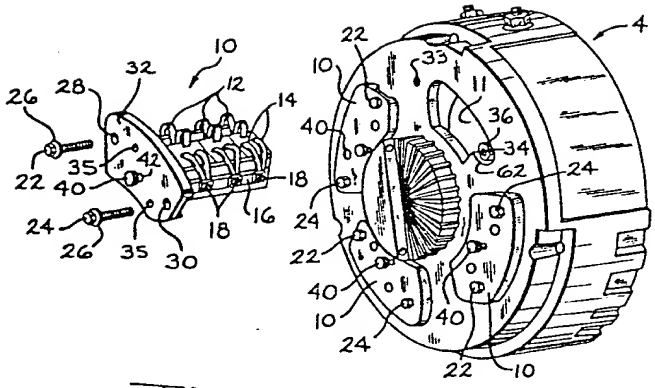


FIG. 2

REMOVABLE BRUSH HOLDER FOR DYNAMOELECTRIC MACHINE

FIELD OF THE INVENTION

The instant invention relates to the field of brush support structure for electrical motors and generators. More particularly, this invention relates to removable brush holders for electric motors.

BACKGROUND OF THE INVENTION

Replacement of electrical contact brushes in electric machines such as motors and generators is usually a difficult and time consuming task. Conventionally, brush holding structures are provided either in the interior of the end plate of the motor or on the inside of the motor housing. In either event, the motor must be partially disassembled to replace brushes. This is a time consuming and difficult task, particularly when the motor must be removed from the assembly before it can be disassembled to replace brushes. Such disassembly is necessary in many applications, and in particular where the motor is installed on an electrically driven vehicle. In addition, holding the brushes and brush box clear of the armature contact surface while a armature is being installed in the motor, or while the brushes are being installed in the motor, is important, to avoid scratching the armature contact surface. Such a surface is known as a commutator

in the case of a D. C. machine, and as a slip ring in A.C. machines. Any damage to the commutator or slip ring tends to magnify itself, causing accelerated wear of both the brushes and the armature contact surface. There are two basic, nonexclusive, mechanisms by which a scratch in a commutator bar or slip ring may accelerate wear to both brushes and the armature contact surface. First, as the commutator revolves, the scratch will roughen the surface of the brush. On a microscopic scale, this increases the amount of arcing between the brush and the commutator bar segments or slip ring. This increased arcing causes a rougher than normal commutator, resulting in faster brush wear, further roughening of the surface of the brush, and a further increase in arcing, which further damages the commutator or slip ring. Secondly, a scratched commutator or slip ring can result in an out-of-round commutator or slip ring, which also causes increased arcing and further damage to brushes and commutator or slip ring. Again on a microscopic scale, when a brush and a scratch interact, the brush is either cocked in its holder, or bounced a short distance radially to the commutator or slip ring. If it is cocked in the brush holder, it will rock or oscillate for a short period of time. As it rocks or oscillates, increased arcing occurs between the edge of the brush further from the commutator or slip ring, wearing both brush and commutator or slip ring. In addition, the resultant rounding of the brush, on a microscopic scale, reduces contact area between the brush and the commutator or slip ring, further accentuating wear to both the commutator or slip ring and the brush. If the brush is deflected vertically, the commutator or slip ring will turn beneath it before it returns (and bounces several times). During this

time, arcing will increase, resulting in a small flat sport on the commutator or slip ring. This flat spot will be accentuated during subsequent revolutions of the electric machine, since, even ignoring the effect of the scratch, the commutator or slip ring effectively falls away from the brush when it reaches the flat spot, causing further accentuated arcing, and further wear. And, of course, the brush bounces when recontacting the commutator or slip ring, causing further small flat spots. This semirandom shape causes much increased brush wear, since the brush crumbles slightly each time the brush spring returns it violently to the surface. Therefore, it is important to avoid scratching the commutator or slip ring while installing and removing brushes. Scratching of a commutator or slip ring is much less likely to occur when the brushes may be removed radially to the commutator or slip ring, as in large, stationary motors and generators, operating in an extremely clean environment. However, when a motor must be protected due to its operating environment, or when surrounding structure blocks radial access to the motor, axial movement of either brushes or commutator or slip ring must occur when brushes are being renewed, whether by use of applicants invention, or by conventional disassembly of the motor. One structure for a brush holder which may be removed axially is disclosed in U. S. Patent No. 3,450,915, issued July 17, 1969, to Zumsted, entitled BRUSH ARRANGEMENT FOR DIRECT CURRENT DYNAMO-ELECTRIC MACHINE. There, a brush holder is secured to a ring which is removably attached to the motor end plate. The end plate of the machine is provided with openings through which the brush holder and brushes protrude. As the ring is removed, a spring loaded pin acts to apply an end pressure against the brushes in the brush holder to keep the brushes from falling out of the

brush holder. Conversely, this spring loaded pin will hold the brushes in the brush holder, out of contact with the commutator, as new brushes are being inserted from the end of the motor, until the brushes are almost in place, at which time the spring loaded pin releases pressure against the brushes, releasing the brushes. Therefore, for the last increment of movement, the brushes will slide axially along a commutator segment or segments, and depending on brush material, may do microscopic scratch-type damage to the commutator, with the possible results described above, or may damage a brush by scraping it across the sharp commutator edge. In this regard, it should be noted that new brushes have sharper edges than used brushes, and are more likely to cause damage to the commutator. Also, and most importantly, with the structure disclosed by Zumsteg, it is imposible to cock or tilt the brush holder to insure that the hard metal brush holder or brush box itself does not touch the commutator, in addition to the fact that the disclosed structure is inoperative when supporting and surrounding structure crosses the axis of the motor, such as when a motor is used on an industrial forklift truck. In such an application, the task of removing and replacing the motor to renew or inspect the brushes consumes about four hours, in contrast to the brush renewal time of about 30 minutes using applicant's invention.

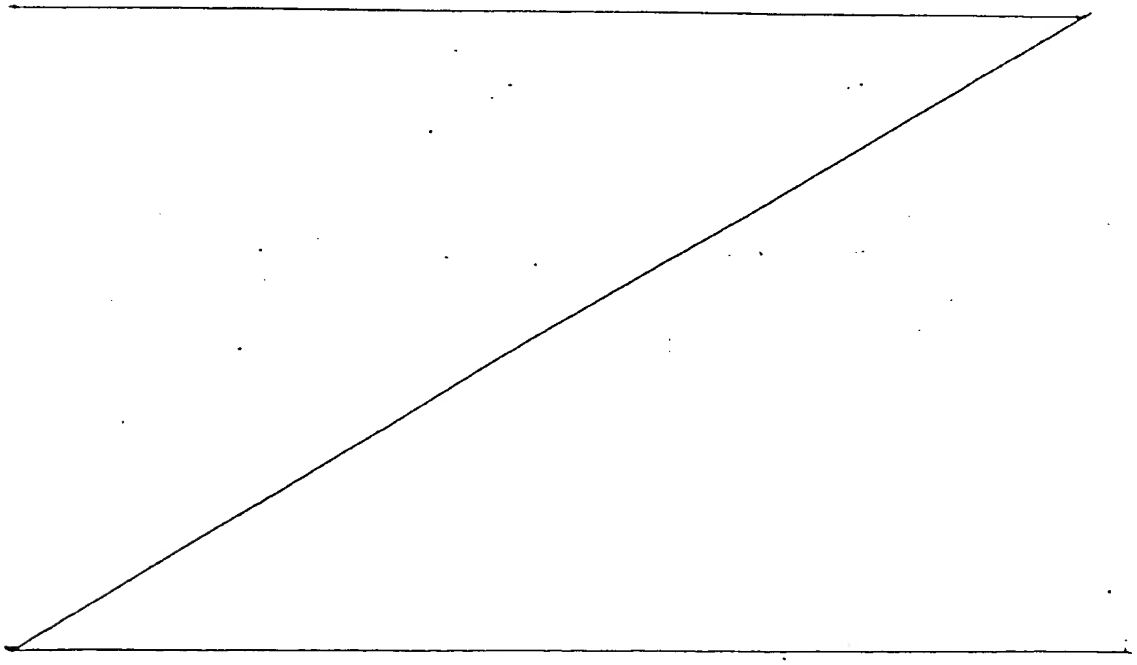
In addition, brushes may be themselves damaged during insertion and removal. Allowing brushes to contact the commutator or slip ring before fully in place drags the last brush over the sharp corner of the commutator or slip ring, possibly breaking the brush. Upon removal, if not restrained, a brush will snap downward as it clears the commutator or slip ring and may smash against other structure, or may simply protrude too far, and be easily accidentally broken. The instant invention overcomes such disadvantages of known structures for brush holders.

Also, it is desirable to maintain the surface of a brush which slides upon an armature contact surface in compression, to insure firm contact. The amount of pressure on a brush may determine its rate of wear and useful life. While frictional forces increase as pressure upon a brush increases, this does not imply that low brush pressure corresponds to long brush life. To the contrary, low brush pressure results in chattering and increased arcing, and rapid brush wear, by some of the mechanisms described above. Therefore, pressure upon brushes should be maintained at or near a value experimentally determined to result in a minimum brush wear rate. One prior attempt to do this utilized cumbersome movable pivoted brush holders in the shape of a lever arm and torsion springs with free ends insertable in notches in the lever arm body. This approach may be usable with large dynamoelectric machines, where the brush holder assembly is freely and easily accessible, and where there are no space or size limitations.

Where space permits, a linear spring which coils up when released may be used to provide brush pressure. A free end of this spring is anchored to the brush box near the armature contact surface, pulling the brush towards the armature as the brush wears and the spring coils up and presses its furthermost surface. This is a bulky arrangement, best suited for large stationary generators and motors, so that extremely long brushes can be used, for long brush life.

Conventionally, particularly in mobile application, where space and weight restrictions apply, a spiral-wound spring, with a free end in the form of a cantilevered lever arm, provides a somewhat constant force upon a brush, but makes no provision for adjusting pressure upon a brush in accordance with experimentally determined requirements, or even for compensating for the decrease in pressure as the spiral spring unwinds.

The instant invention overcomes these and other deficiencies of the prior art.



SUMMARY OF THE INVENTION

It is a primary object of the invention to produce an axially-removable brush holder, removable from the exterior of a dynamoelectric machine, and having means for retaining the brushes in the brush holder when brushes are being installed or removed, to prevent scratching of the commutator or slip ring.

It is a further object of the invention to produce an axially-removable brush holder which is independent from any other brush holders in a motor, so that it can be tilted or cocked to avoid any possibility of the brush or brush holder contacting the commutator or slip ring during insertion or removable.

It is a further object of the invention to produce a brush holder structure such that tightening the bolts holding the brush holder to an end frame of a motor also establishes the electrical connection to the brush holder.

It is a further object of the invention to produce a brush holder structure wherein pressure on the brushes may be conveniently adjusted.

It is a further object of the invention to produce a brush holder structure where pressure on the brushes may be adjusted by rotating a rod member to which spiral springs are mounted, useable with fixed or removable brush holders, and useable where external or internal adjustment provisions are desired.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial side elevational view, partially in section, showing a motor having a removable brush holder according to the preferred embodiment of the invention.

FIG. 2 is an exploded view, in perspective, showing an end frame of a motor and a removable brush holder according to the preferred embodiment of the invention.

FIG. 3 is a side elevational view of a brush holder according to the preferred embodiment of the invention, showing the means for retaining the brushes in the brush holder for insertion and removal of the brush holder in operative position.

FIG. 3a shows the embodiment of the brush holder shown in FIG. 3, with the means for retaining the brushes in the brush holder shown in inoperative position.

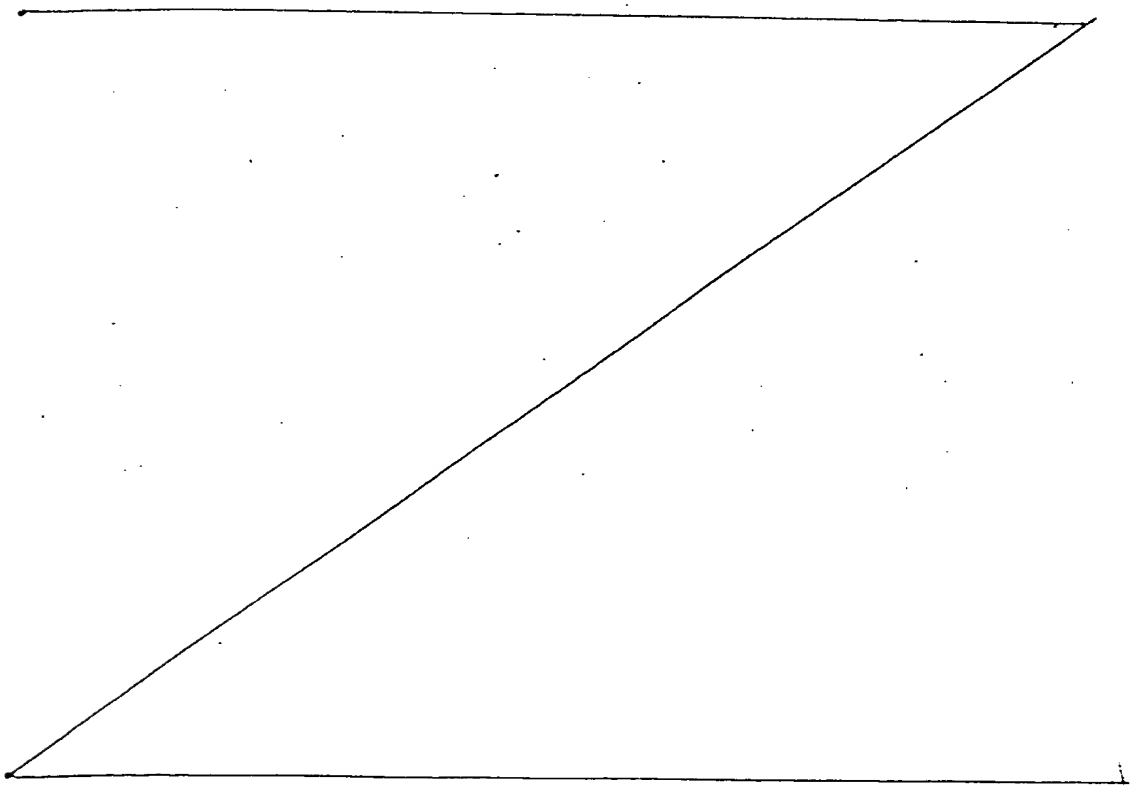


FIG. 4 is a schematic side elevational view, partially in section, of the structure for electrically connecting or disconnecting the brush holder by installing or removing a bolt retaining the brush holder to the end frame of the motor.

FIG. 5 is a perspective view of an alternate structure for brush holder according to the invention.

FIG. 6 is a side-elevational view of the brush holder of FIG. 5.

FIG. 7 is a front elevational view of a second alternate and preferred embodiment of a removeable brush holder according to the invention.

FIG. 8 is detailed perespective view of the brush holder shown in FIG. 7.

FIG. 9 is a partial top elevational view of the brush holder shown in FIG. 7.

FIG. 9a is a partial top elevational of the brush holder shown in FIG. 7, showing the operation of a brush pressure adjustment mechanism.

FIGS. 10 and 11 show brushes and pressure springs adapted for use with the brush holder shown in FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1 and 2 show a motor 1 having a main frame 2 and an end frame 4. Motor 1 has a conventional armature contact area such as commutator structure 6, shown contacting brushes 8 in a removable brush holder 10, which fits through aperture 11 in end frame 4. Obviously, only the axial position of brushes 8 need be varied from that shown to make the invention usable with the slip rings of an A.C. dynamoelectric machine as well as the commutator of a D.C. machine.

The brushes 8 are held in contact with commutator 6 by wound springs 12, retained in conventional manner on T-shaped supports, best shown in FIG. 6.

Brush lead wires 14 are connected to bus bar 16 by screws 18. Bus bar 16 includes tab 20, which serves as the electrical connection point for brush holder 10. Tab 20 is most clearly illustrated in FIGS. 1 and 4.

Bolts 22 and 24, with spring washers 26, pass through apertures 28 and 30 in face 32 of brush holder 10. A hole, not shown, in tab 20 is aligned with aperture 30. As most clearly shown in FIG. 4, bolt 24 passed through aperture 30, and into threaded hole 34 of bolt 36, pressing tab 20 against head 38 of bolt 36 to make electrical contact as will be described below.

Bolt 22, having spring washer 26, is passed through aperture 28 in face 32 of brush holder 10, into threaded aperture 33 in end housing 4. This bolt serves only to retain brush holder 10 in place, and serves no conductive purposes in the preferred embodiment of the invention. Also shown in FIG. 2 are recesses 35, intended to protect fastening means such as rivets from accidental contact.

Each brush holder 10 includes a clamping means such as screw 40, which may be passed through a threaded aperture 42, to press against brushes 8 in brush holder 10, locking brushes 8 in their current position, whether selected manually or due to contact with an armature contact surface such as commutator 6. If desired, a separate threaded aperture could be provided through face 32 of brush holder 10 for the purpose of storing screw 40 in a position where it could not be inadvertently left in aperture 42 and bearing against brushes 8 after installation of brush holder 10 was completed.

As most clearly illustrated in FIG. 3, brush holder 10 includes a face portion 32, at least one

reinforcing rib 44, a body portion 46, and a brush box 48. Member 50 is a flange integral with brush box 48, cooperating with rivets or like fasteners disposed through face 32 which may be nonconductive, recessed, or insulated in conventional manner. In the preferred embodiment, fasteners are recessed in recesses 35 to avoid accidential contact, and the recesses may be filled with an insulating material.

Portions 32, 42 and 46, in the preferred embodiment, are integrally formed from an insulating plastic, avoiding the use of insulating washers and tubes and the like for attaching brush box 48, and avoiding complex structure for isolating brush holder 10 from frame 4, and insulating or covering brush holders 10, which would be contrary to some of the advantages of the invention. One suitable material is glass and mineral fiber filled polyphenylene sulfide, available from Phillips Chemical Company under the registered trademark RYTON, type R-8 having been found to be satisfactory. Obviously, other materials could be used. Screw 40, in the preferred embodiment, has a knurled or ribbed head 52, to facilitate manual rotation. From the inactive position shown in FIG. 3a, with tip 54 not in contact with a brush 8, screw 40 is rotated inwardly at a distance of approximately 1/8" (approximately 3 millimeters) to active position as shown in FIG. 3, with tip 54 of threaded portion 42 bearing against brushes 8, pushing then against each other and against end 56 of brush box 48, frictionally retaining them in place.

FIG. 4 is a detailed view of the structure whereby one of the bolts retaining brush holder 10 in aperture 11 of motor end frame 4 also serves to make and break electric contact. As shown in FIG. 4, a special bolt 36 has a head 38, a threaded bore 34, and a shoulder 60. Motor end frame 4 has a recess 62, which has a shoulder 64 and bore 66. An insulator

68 is retained between head 38 of bolt 36 and shoulder 64, and has a portion 70 extending through bore 66. Insulator 72 is retained between spring washer 74 and nut 76 and the interior surface of motor end frame 4. Nut 76 is mounted on threaded portion 78 of bolt 36. To make electical contact, a tab 80, having wires 82 and 84 attached in conventional manner, and having an hole therethrough, (not shown), is placed on threaded portion 86 of bolt 36. Tab 80 is retained between shoulder 60 and nut 88 on threaded portion 86, and makes electrical contact between bolt 36 and wires 82 and 84, for connection to other components of motor 1. Bolt 24 includes an unthreaded portion 86, and a threaded portion 88, with a shoulder 90 separating portions 86 and 88. When threaded portion 88 is threaded into bore 34 of bolt 36, tab 20 is pressed between shoulder 90 and head 38. Portion 88 is of an appropriate length to avoid placing undue pressure on face 32 of brush holder 10 when installing bolt 24 with sufficient tightness to make good electrical contact between tab 20 and bolt 36.

FIGS. 5 and 6 illustrates an alternative, non-preferred structure for a brush holder according to the invention, which is functional where brushes are not inspected, and are not removed for replacement until the motor ceases to operate. A brush holder generally indicated as 100, includes the same structural elements as brush holder 10, with the exception of clamping means screw 40, and with the addition of a rod member such as plastic pin 102. Pin 102 is passed through aperture 104 in face portion 32 and body portion 46 and apertures 106 in brush box 48, after brushes 8 have been manually positioned to allow pin 102 to be inserted through apertures 104 and 106. Pin 102 is provided with T-handle 108, to facilitate its removal. Brush holder 100 is inserted through an aperture 11 in the same manner as brush holder 10, to be described below, and fastened in place by

means of bolts 22 and 24. Then, pin 102 is withdrawn, allowing the brushes 8 to make contact with an armature contact surface such as commutator 6. Aside from the face that brush holder 100 does not accomplish the task of holding the brushes in position when the brush holder 100 is being removed, there is a possible disadvantage with the use of a pin such as 102 to maintain brushes in position for brush holder insertion. When pin 102 is withdrawn from apertures 104 and 106, brushes 8 are propelled against the surface of the armature contact surface such as commutator 6 by springs such as springs 12. This may result in breakage of brushes 8.

Also shown are T-shaped spring supports 110, having a conventional D-shaped crossmember for retaining D-shaped innermost coils of springs 12.

The internal wiring of a dynamoelectic machine such as motor 1 is conventional, and forms no part of the instant invention. In the embodiment illustrated, there are four separate brush holders 10 or 100 which are wired in pairs internally by means of wires 82 and 84, and other wires, not shown, and are connected to conventional field windings or external terminals in motor 1 in conventional manner.

To install brushes using a removable brush holder 10 according to the preferred embodiment of the invention, the brushes 8 are first positioned as shown in FIG. 3 manually, with brushes 8 projecting slightly beyond surface 90 of brush box 48, so that any inadvertent contact with an armature contact surface such as commutator 6 will be with comparatively soft brushes 8 rather than with brush box 48. Screw 40 is then tightened to retain brushes 8 in this position. Brush holder 10 may be cocked or tilted to increase the distance between brushes 8 or brush box 48, and the armature contact surface such as commutator 6, to further avoid such inadvertent contact as brush holder 10 is inserted through aperture 11. Bolts

22 and [redacted], with spring washers 26, are then inserted through apertures 28 and 30 in brush holder 10 and into threaded hole 32 and threaded bore 34, and tightened in conventional manner. Tightening bolt 24 causes tab 20 of bus bar 10 to be compressed between shoulder 90 and head 38 of bolt 36, making electrical contact with bolt 36, which in turn is connected to wires 82 and 84. Screw 40 is then rotated to withdraw it a distance A, as shown in FIG. 3 and 3a, to gradually release the brushes 8 and allow then to contact an armature contact surface such as commutator 6. Screw 40 may then be stored in a separate threaded hole which does not extend through flange 50, if desired. The provision of such a hole may be desirable in some applications, particularly where the motor is accessible to unauthorized persons. Alternatively, screw 40 may simply be removed and stored separately, such as with a supply of replacement brushes 8. To remove brush holder 10 for inspection or renewal, the sequence of events is reversed. Screw 40 is brought to bear against brushes 8, retaining them in position. Screws 22 and 24 are removed, the removal of screw 24 and movement of brush holder 10 breaking electrical contact. Brush holder 10 is cocked or tilted to move brushes 8 away from an armature contact surface such as commutator 6, and brush holder 10 is removed. In the preferred embodiment, a gap 92 is left between face 32 and end housing 4, to allow some air flow to the interior of motor 1. As is known in the art, a gasket could be provided to seal this opening, although a differing and more expensive composition of brushes 8 may be desirable to provide satisfactory brush life in the absence of the lubrication provided by atmospheric moisture.

FIGS. 7, 8, 9 and 9a illustrate a removable brush holder which also includes means for adjusting

tension of springs which hold brushes against the armature contact surface, indicia for measuring the remaining length of brushes after they have been removed from the brush holder for inspection, and correlating the length remaining with a tension setting for the springs. Since the embodiment shown in FIGS. 7, 8, 9 and 9a is an improvement on brush holder 10, as shown in FIG. 1, 2, 3, and 3a similar numbers for corresponding elements will be used wherever possible. As shown in FIGS. 7, face portion 32 includes apertures 28 and 30 for mounting a brush holder 200 to an end frame 4, a threaded aperture 42 adapted to receive a screw 40 or the like for clamping brushes in place, four recesses 35 for rivets, not shown, holding face portion 32 to brush box 48. Also shown are recesses 202, 204, 206, and 208, adapted to received an end 210 of a lever 212, rotatably extending through an aperture 214 in face portion 32, and an indicia 216 which is preferably embossed on, or engraved in, the surface of face portion 32. Indicia 216 is in the general form of a side view of brush used with a brush holder 200, as it would appear at various stages in its useful life.

To make use of such an indicia, a user might visually compare a brush 8 with indicia 216, or may remove a brush 8 and place it against indicia 216, in alignment with indicia 216. Then, with the end surface of brush 8 which has wires 14 attached placed against line 218, the position of the end surface of brush 8 which contacts the armature surface determines the proper setting of lever 212, to match spring tension against brush length. With the brush 8 positioned as described, if line 220 alone is visible, lever 212 should be rotated to place end 210 in aperture 202. If line 222 is visible, end 210 should be placed

in aperture 206. If line 226 is visible, the brush should be discarded and replaced. Indicia 216 and apertures 202, 204, and 206, include indicia relating brush length to the positioning of lever 212. End 210 of lever 212 may also be placed in aperture 208. As will be further described below, placing lever 212 in this position may either completely remove spring pressure from the brushes 8, or may be usable to lift brushes 8 to a retacted position for insertion and removal of brush holder 200 in aperture 11 of end frame 4. A screw 40 may be placed in threaded aperture 42 to maintain brushes 8 in raised position, or in a manually selected position.

FIG. 8 is a sectional perspective view of FIG. 7, showing end 210 and lever 212 in greater detail, and showing a screw 40 with knurled head 52 disposed in aperture 42, and showing a portion of indicia 216 as engraved into face portion 32 of brush holder 200.

FIGS. 9 and 9a illustrate the manner in which angular positioning of lever 212 affects brush spring tension. Comparing FIG. 9 with FIG. 6, it will be seen that springs 12 are retained on flattened, D-shaped sections 218 of lever 212, which is supported on arms 220 and 222 which protrude from brush box 48, rather than being supported on D-shaped supports 110. By rotating lever 212, and D-shaped section 218, the angular position of springs 12 is varied, thereby varying the force they exert against brushes 8. Lever 212 is positioned in an aperture 224 through face portion 32 and body portion 46, an aperture 226 through arm 220 and an aperture 228 through arm 222. Lever 212 is retained in position by means of a spring 230 disposed adjacent an end 234 of lever 212, and retained in position by pin 236 through an aperture, not shown, in lever 212 adjacent end 234. As is apparent, the structure described is easy to assemble, lever

212 being placed through apertures 224, 226, and 228, spring 230 and washer 232 being applied over its end 234, and a cotter pin or other type of pin 236 inserted through an aperture adjacent end 234. It will be apparent that springs 230 may be positioned at another portion of lever 212, and that other means of retaining the end of a lever 212 are possible. For instance, should springs 212 be prevented from moving along portion 218 of lever 212, and prevented from sliding upon brushes 8, sideways distortion of springs 12, perpendicular to the direction of winding of springs 12, will provide a restoring force to lever 212.

As illustrated in FIGS. 9 and 9a, to change the angular position of D-shaped portion 218 of lever 212, lever 212 is grasped adjacent end 210, and manually moved outwardly from face 32 a distance B, removing end 210 from an aperture 202, 204, 206, or 208, and allowing lever 212 to be rotated. Note that when directions are mentioned, they are for propose of explanation of the drawings, and not intended as limitions. As can be seen FIGS. 9 and 9a, spring 230 is compressed by this manual movement, and acts to urge end 210 against face portion 32, and into an aperture 202, 204, 206, or 208.

It will be apparent that the brush pressure adjustment structure disclosed herein is also usable with fixed, nonremovable brush holders, and is desirable for such brush holders in applications where in a dynamoelectric machine is regularly disassembled for inspection, so that brush spring tension may be adjusted at that time based on the remaining brush length, to increase brush life. In short, a lever such as lever 212 having a flattened, D-shaped portion such as 218, a return spring such as spring 230, and detent apertures such as apertures 202, 204, and 206, can

be provided in structure for a fixed brush holder. The structure illustrated in FIGS. 9 and 9a may also be modified to place end of lever 212 inside the motor, as well as having lever 212 protruding through the end frame of the motor. An embodiment of an adjusting mechanism according to the invention for a non-removable brush holder may be visualized by interpreting FIGS. 9 and 9a, interpreting body portion 46 as a conventional brush mounting ring, and interpreting face portion 32 as the end frame of a conventional dynamoelectric machine, or by a simple rearrangement of FIGS. 9 and 9a to place end 210 inside the motor, such as by placing spring 230, washer 232 and pin 236 on the opposite side of arm 222, and providing detent apertures for end 210 in the end surface of brush box 48. As described above, only the position shown for brushes 8 need be varied to use the invention with slip rings, in place of a commutator, as shown.

There are several types of brushes, which are available for use on larger dynamoelectric machines, to protect the material of brushes from high spring forces and to facilitate the removal of badly worn brushes from deep brush holders, and to satisfy other needs. These and other types of brushes are described in American National Standard Brushes for Electrical Machines, ANSI/NEMA Standards Publication No. CB1-1977, a joint standard of the American National Standards Institute, Inc., and the National Electrical Manufactures Association, copies available from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018, and from the National Electrical Manufacturers Association, 2101 L. Street NW., Washington, D. C. 20037. Of the various configurations shown having lifting and guide clips therein, Type-D, having

a bail-type lifting clip fixed to the brush by a metal plate, and Type-E having a lifting clip formed into the shaped of a hook, may be advantageously used with an embodiment of the invention. As shown in FIG. 10, a brush 8 may be provided with a bail-type device 300, retained to brush 8 by a clip 302 held to brush 8 by rivet 304. Conventional springs 12 have a folded-back portion at an end thereof which contacts a brush such as brush 8, to avoid damaging the brush. A brush 8 may also have a protective plate similar to strap 302 to further protect it from damage by the end of a spring. Such a brush with a bail-type handle may be used in conjunction with a preferred embodiment of the invention, to allow the brush to be lifted into a retracted position by moving end 210 of lever 212 into aperture 208. To accomplish this, an end 306 of a spring such as spring 12 may be fabricated to have aperture 308 between folded-back tip 310 of spring 12 and portion 312 of spring 12, so that the bail 300 may be snapped into aperture 308. Such a brush and spring assembly is preferrably designed so that spring 12 presses upon strap 302 to urge brushes such as brush 8 against an armature contact surface, and pulls upon bail 300 to raise the brush for installation and removal of a removable brush holder according to the invention.

FIG. 11 shows a brush 8 with a Type-E clip formed in the shaped of a hook. Clip 314 is retained to brush 8 by rivets 316, and has a upright portion 318 and a folded-back portion 320. FIG. 11 also shows the tip shape of a spring 12 adapted to use such a brush with an embodiment of the present invention. Spring 12 is manufactured with a sharp reverse curve adjacent its tip, the folded-back tip portion forming a portion 322 adapted to be clipped under portion 320 of clip 314. Upward motion of portion 322 of spring 12 caused by placing end 210 of lever 212 into aperature 208 will cause brush 8 to be lifted into a retracted position.

As will be apparent, numerous variations, combinations of features, and modifications may be made to the described embodiments of the invention without departing from the spirit and scope of the invention.

CLAIMS:

1. In a dynamoelectric machine having an armature contact surface, and an end frame, the combination comprising:

a plurality of separate removable brush holders adapted to be axially removable from the exterior of said machine, said end frame of said machine having apertures therethrough adapted to receive each said brush holder therein;

said end frame including means for receiving attachment means for attaching said brush holder to said end frame, said means for receiving including means for establishing electrical contact between said dynamoelectric machine and said removable brush holder;

each said brush holder including means adapted to contact said means for receiving, to establish an electrical connection between said brush holder and said dynamoelectric machine;

each said removable brush holder including manually operable means for retaining a brush in a predetermined position therein and releasing said brush after said brush holder is firmly attached to said end frame;

whereby each said brush holder may be tilted to avoid contact with said armature contact surface while being passed through said aperture, electrical contact to said brush holder is established by attaching said brush holder to said end frame with said attachment means, and said brush may be retained in a position removed from said armature contact surface until all movement of said brush holder with respect to said armature contact surface has ceased.

2. In a dynamoelectric machine according to claim 1, wherein;

said brush holder defines at least one aperture therethrough adapted to removably retain a rod member therethrough;

said rod member being inserted through said brush holder so that said brush bears against said rod member and is prevented from protruding from said brush holder;

said rod member being removable from said brush holder to allow said brush to protrude from said brush holder;

whereby said rod member may be withdrawn from said aperture in said brush holder after said brush holder is firmly attached to said end frame to allow said brush to contact said armature contact surface.

3. In a dynamoelectric machine according to claim 2, wherein;

said brush holder includes a mounting portion adapted to be retained to said end frame and a brush box portion adapted to retain at least one brush therein;

said mounting portion being made of an insulating material,

said brush box portion being made of conductive material and fastened to said mounting portion.

4. In a dynamoelectric machine according to claim 3, wherein;

said means for receiving including means for establishing electrical contact is a bolt, said bolt having an axial threaded bore formed therein adapted to receive said attachment means;

said bolt having a first threaded portion and a second threaded portion of lesser diameter than said first portion, and separated therefrom by a shoulder;

said bolt being adapted to receive a first nut on said first threaded portion, to retain said bolt to said end frame;

said bolt being further adapted to receive a second nut on said second threaded portion to retain an internal connecting wire of said dynamoelectric machine to said bolt.

5. A removable brush holder for use in a dynamoelectric machine including an end frame provided with unitary means for retaining said brush holder and for establishing electrical contact with said brush holder, said unitary means including a bolt member insulated from said end frame and connected to internal wiring of said machine and adapted to receive fastening means to retain said brush holder to said end frame and establish contact between said internal wiring and said brush holder, comprising;

a face portion adapted to be disposed on the exterior of a first aperture formed in said frame;

a body portion integral with said face portion adapted to be passed through said first aperture;

a brush box portion attached to said face portion and said body portion adapted to slidably receive brushes and including spring means to urge said brushes toward a first position;

a bus bar member electrically connected to said brushes and having a tab portion adapted to be pressed between said face portion and said unitary means for retaining said brush holder and for establishing electrical contact with said brush holder when said face portion is contacting said end frame around said first aperture; and

an aperture formed through said face portion said body portion and said brush box portion adapted to receive a manually withdrawable rod member for preventing said brushes from protruding from said brush box portion towards said first position.

6. A unitary means for use with a dynamoelectric machine for retaining a removable brush holder and for establishing electrical contact between said removable brush holder and internal wiring of said machine, mounted through and electrically insulated from an end frame of said machine, comprising:

a bolt member having a head portion adapted to contact an electrical conductor of said removable brush holder;

said bolt member having an aperture formed therein;

said aperture lying on the axis of said bolt member and formed through said head portion;

said aperture being adapted to receive a means for fastening said brush holder to said end frame;

said bolt member having a first threaded portion adapted to receive a first nut for retaining said bolt member to said end frame;

said bolt members further including a second threaded portion adapted to receive a second nut and an internal wire means of said machine for electrically connecting said internal wire means to said bolt member.

7. In a dynamoelectric machine having an armature contact surface, and an end frame, the combination comprising:

a plurality of separate removable brush holders adapted to be axially removable from the exterior of said machine, said end frame of said machine having apertures therethrough adapted to receive each said brush holder therein;

said end frame including means for receiving attachment means for attaching said brush holder to

said end frame;

means for making electrical contact to each said removable brush holder;

each said removable brush holder including manually operable means for retaining a brush in a predetermined position therein and releasing said brush after said brush holder is firmly attached to said end frame;

whereby each said brush holder may be tilted to avoid contact with said armature contact surface while being passed through said aperture, and said brush may be retained in a position removed from said armature contact surface until all movement of said brush holder with respect to said armature contact surface has ceased.

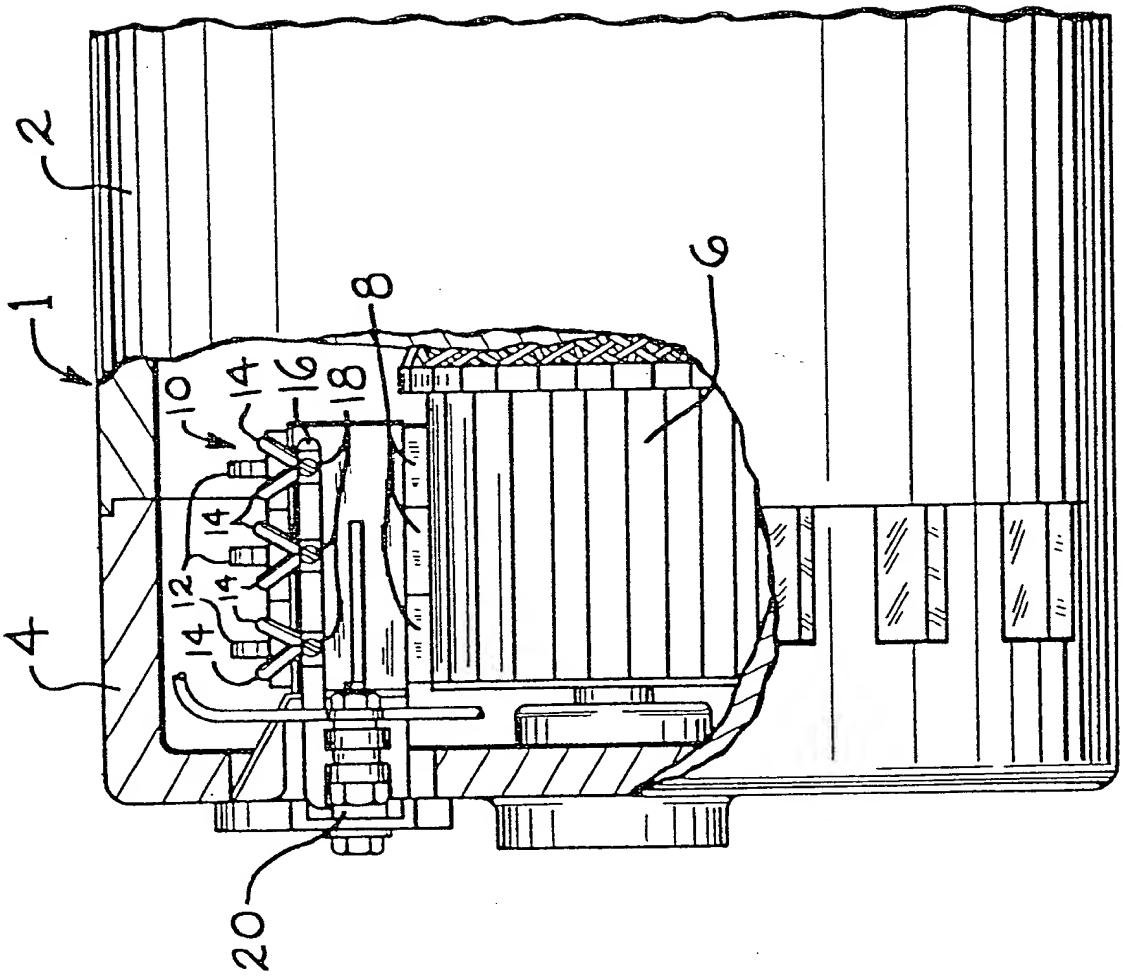


FIG. 1

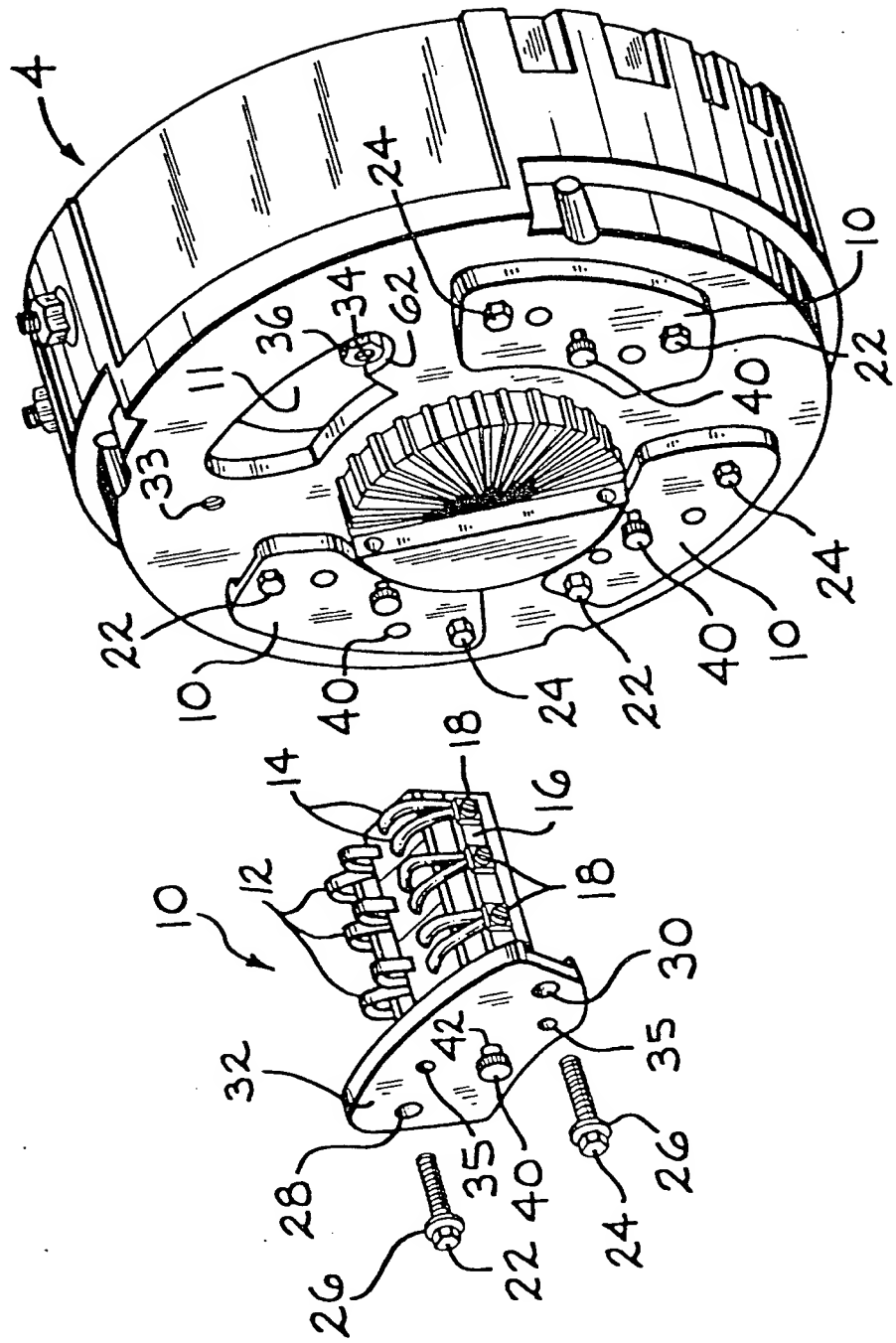


FIG. 2

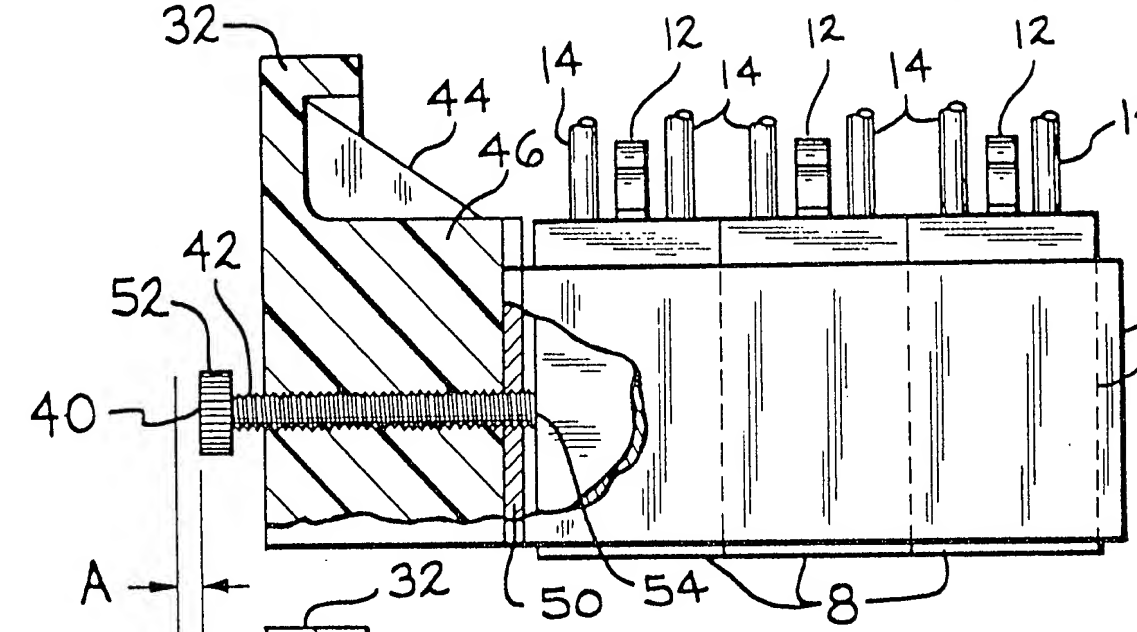


FIG. 3

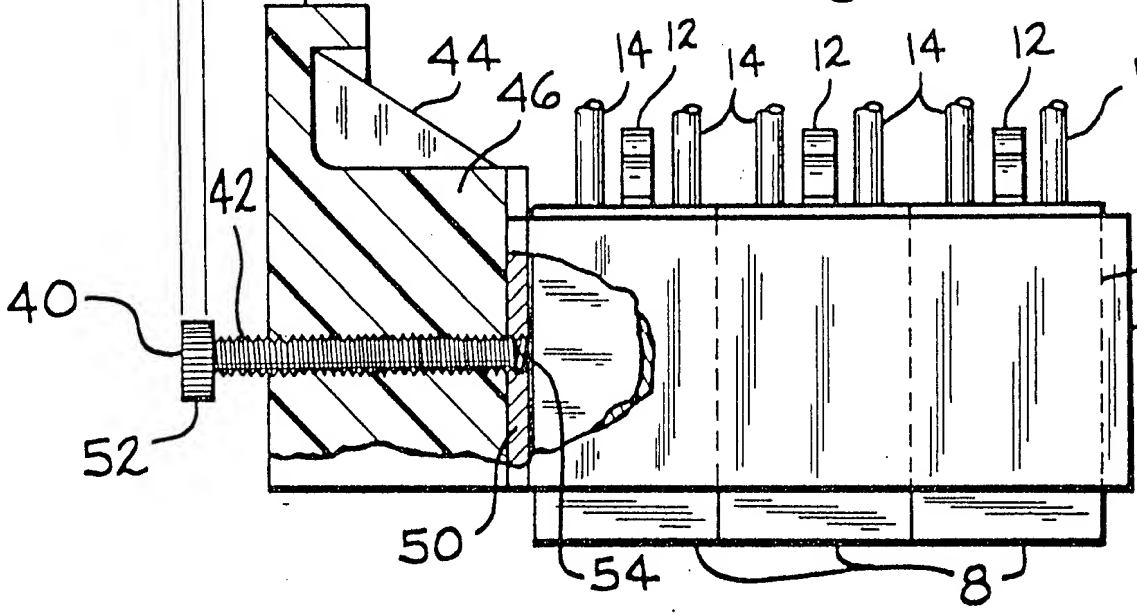


FIG. 3a

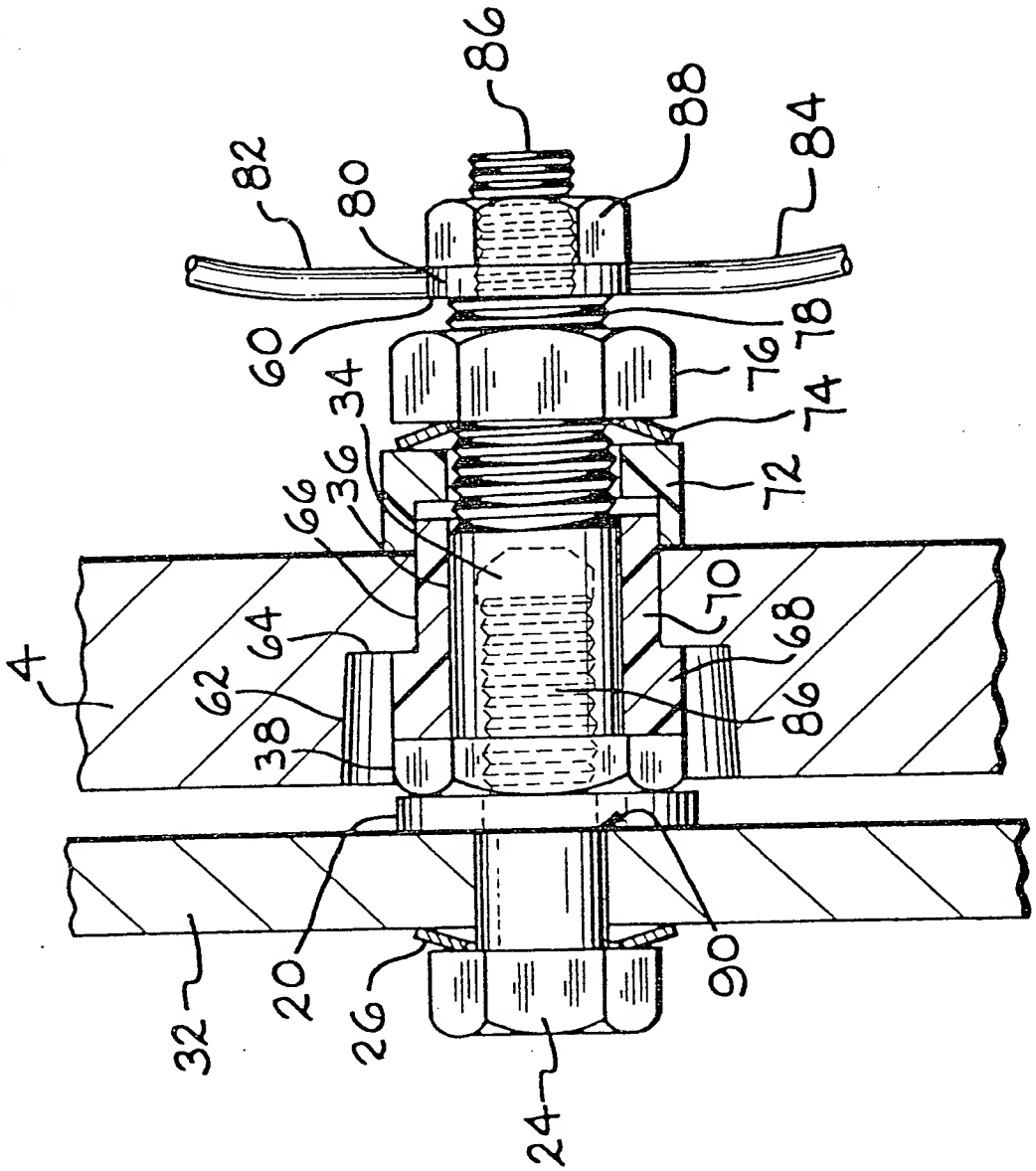
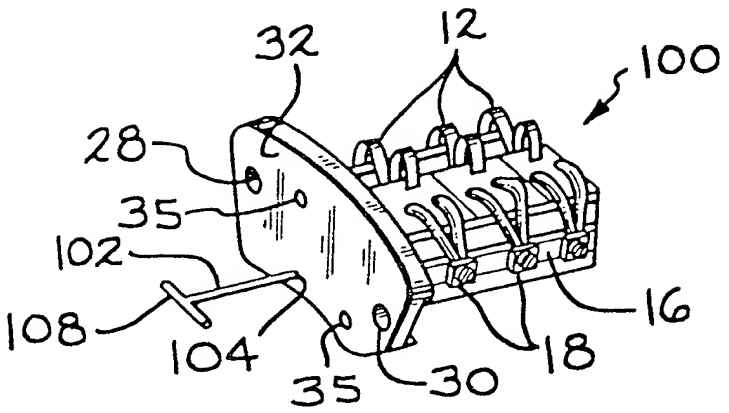


FIG. 4


32
12
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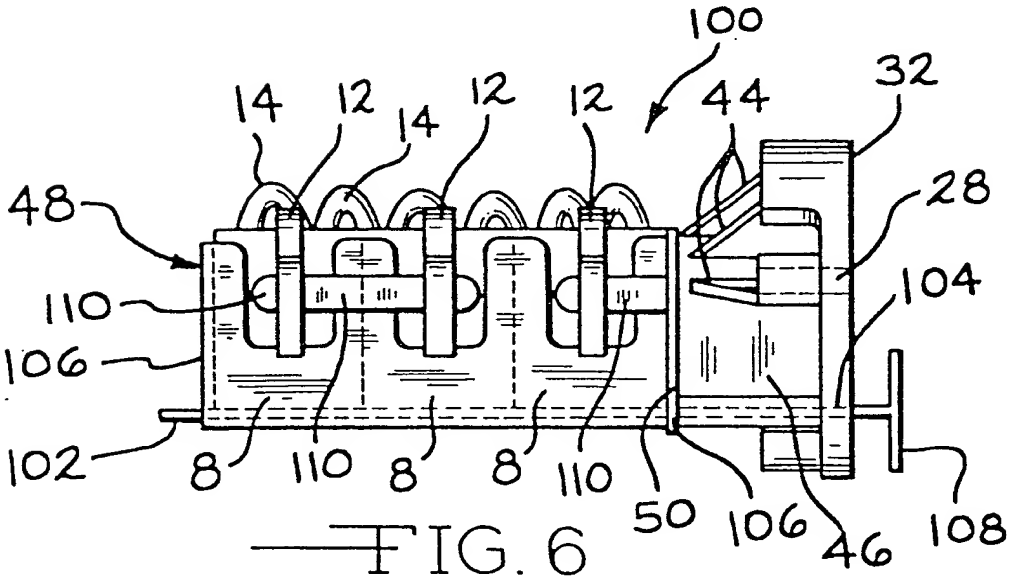
28
35
102
108
104
35
30
18
16

FIG. 5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8
8
110
50
106
46
108

FIG. 6

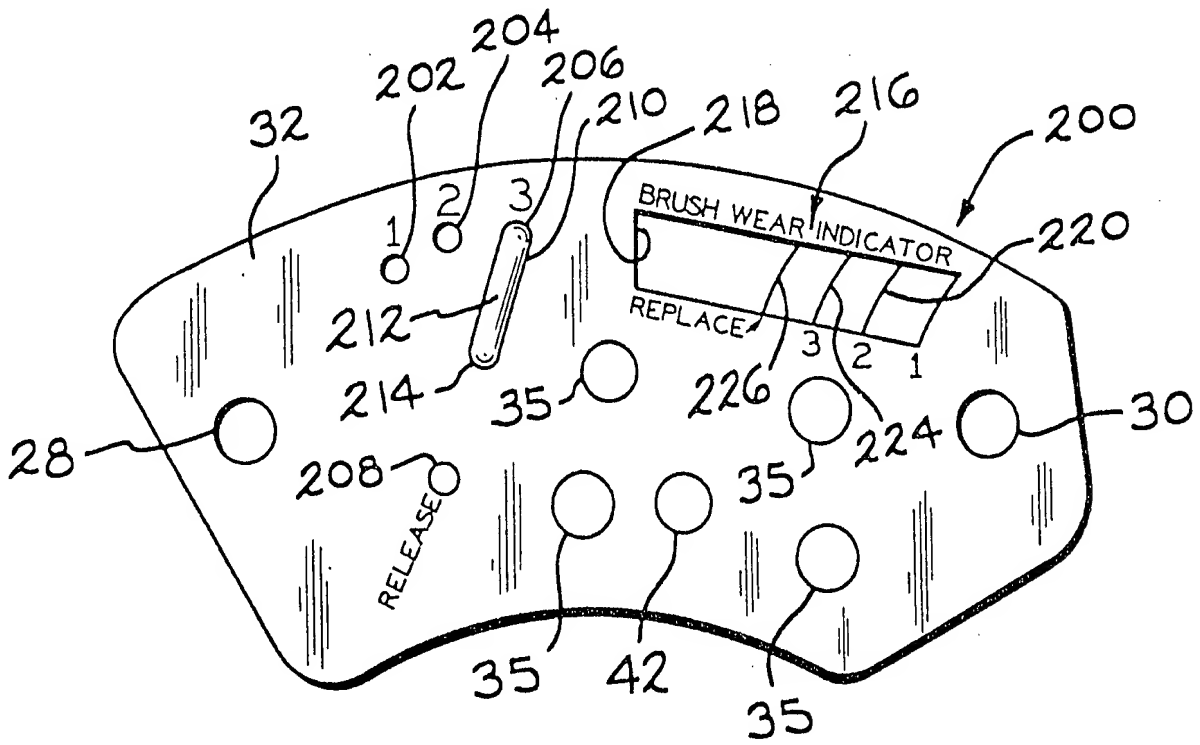

FIG. 7

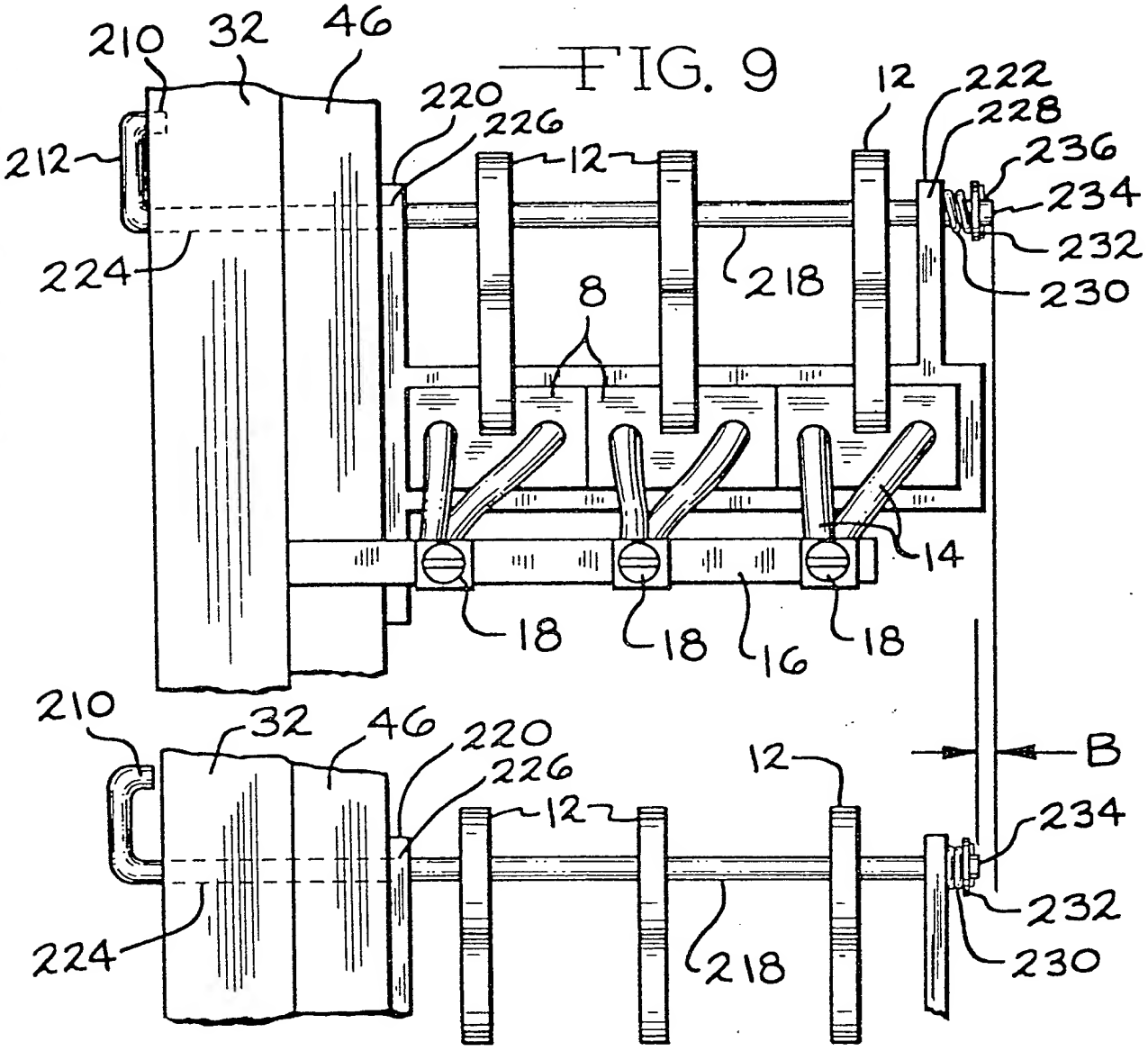

FIG. 9

FIG. 9A

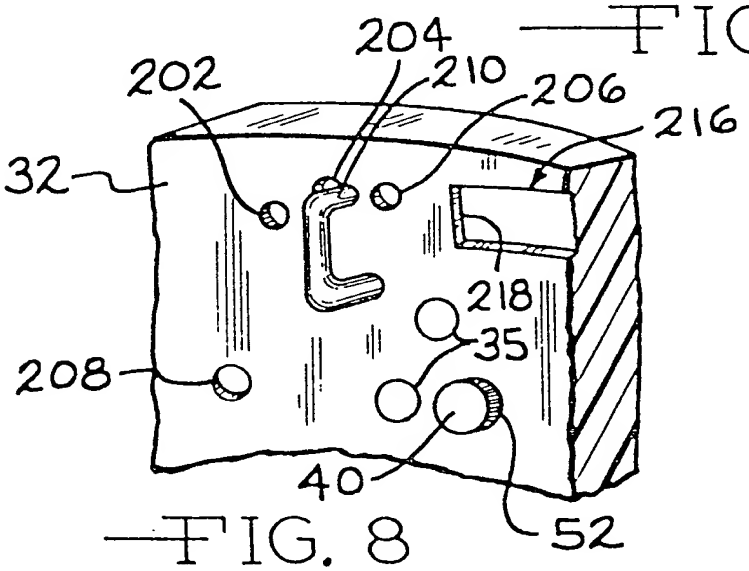

FIG. 8

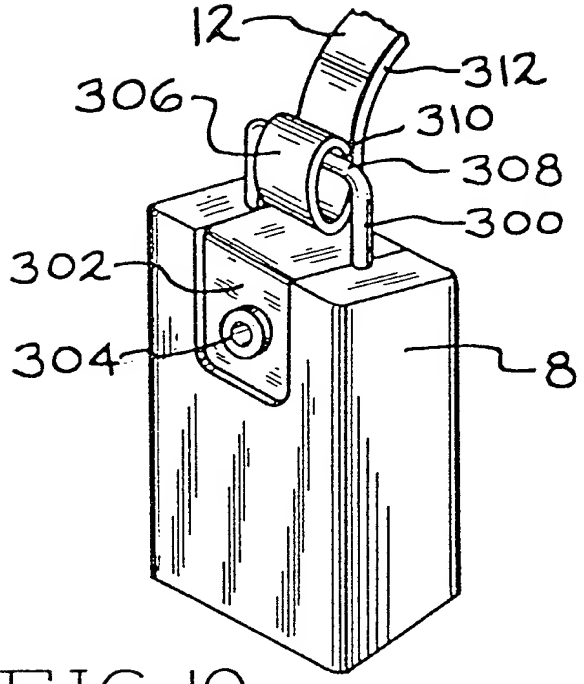

FIG. 10

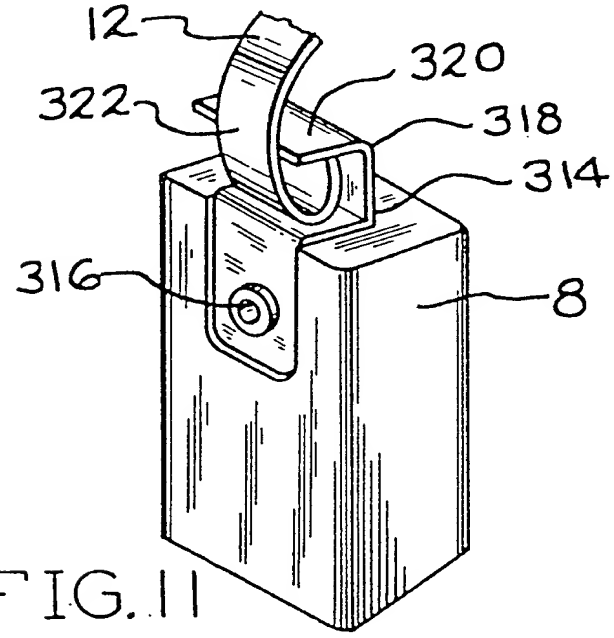

FIG. 11

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(54) Removable brush holder for dynamoelectric machine.

(57) A dynamoelectric machine (1), having brushes which contact an armature contact surface such as commutator (6) or slip rings, is provided with a plurality of independent, individually removable brush holders (10, 100). Each brush holder is provided with either a removable pin (102) to allow brushes to contact the armature contact surface after the brush holder (10, 100) has been installed, or with a clamping bolt (40), retaining brushes (8) in a predetermined position for insertion of the brush holder, and removal of the brush holder, the brush holder being tilted or cocked to avoid contact between it and the armature contact surface. Bolting the brush holder (10, 100) into place makes electrical contact between the dynamoelectric machine and the brush holder by means of an insulated, conductive threaded aperture (34) on the exterior surface of the machine, a mounting bolt (24) inserted into this aperture (34) urging a conductive portion (20) of the brush holder into electrical contact. The brush holder (10, 100) may be further provided with a rotatable spring support (212) for varying the pressure exerted on the brushes, and a measuring scale (216) for correlating the length of partially worn brush with an angular position of the spring support, to facilitate adjustment of brush pressure as brushes wear. Angular adjustment of the position of the spring support may also serve to lift certain types of brushes into a retracted position. The disclosed brush pressure adjustment structure is also usable with non-removable brush holders.

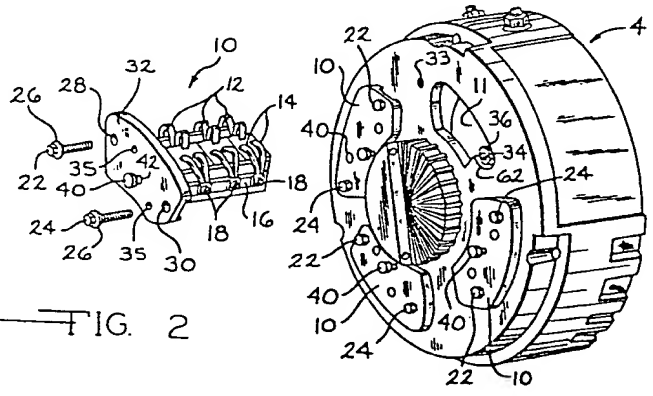

FIG. 2

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Croydon Printing Company Ltd.

0038595

Application number
EP 81 20 0408

European Patent Office

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
DA	US - A - 3 450 915 (BROWN BOVERI & CIE) * Figure 1; column 2, line 10 to column 3, line 10 *	1,2,3, 7
	US - A - 3 219 860 (GENERAL MOTORS) * Figures 2,3; column 3, line 52 - column 4, line 44 *	1-4, 6,7
	US - A - 3 242 362 (FORD MOTOR) * Figure 2; column 3, lines 35-70 *	1,2,6
	US - A - 2 428 162 (V.A. HOOVER) * Figures 1,3; column 3, line 5 to column 4, line 4 *	1,3,5, 7
	US - A - 2 379 176 (WESTINGHOUSE) * Figure 1; page 2, column 1, line 22 to column 2, line 30 *	1,5,7
	US - A - 3 586 892 (S. SATO) * Figures 3,5; column 2, lines 3-47 *	1,4,7
A	FR - A - 341 570 (SOCIETE DES ETABLISSEMENTS POSTEL-VINAY) * Figure 1; page 2, lines 35-44 *	1

CLASSIFICATION OF THE APPLICATION (Int. Cl.³)

H 01 R 39/42

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

H 01 R 39/40
39/42
39/38

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16-09-1981	WAERN